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FEBRUARY 15, 1924

VOL. 13, NO. 2

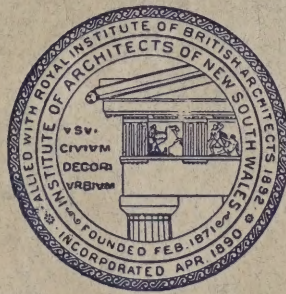
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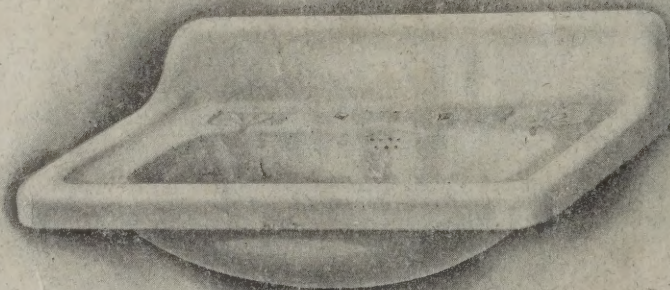
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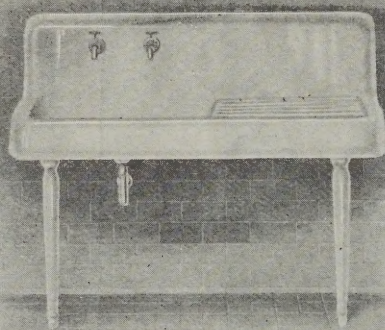
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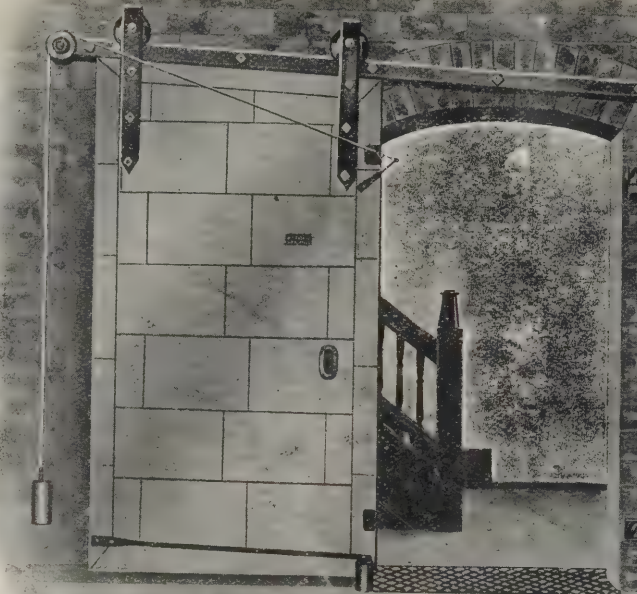
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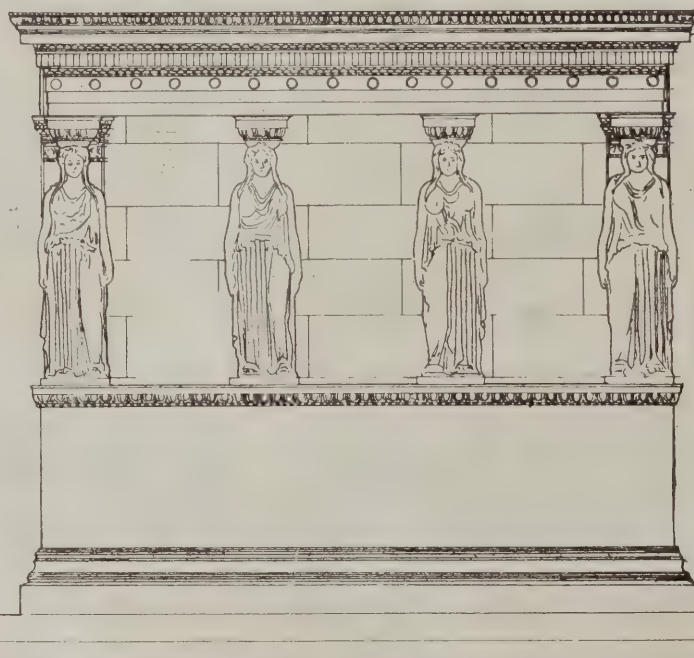
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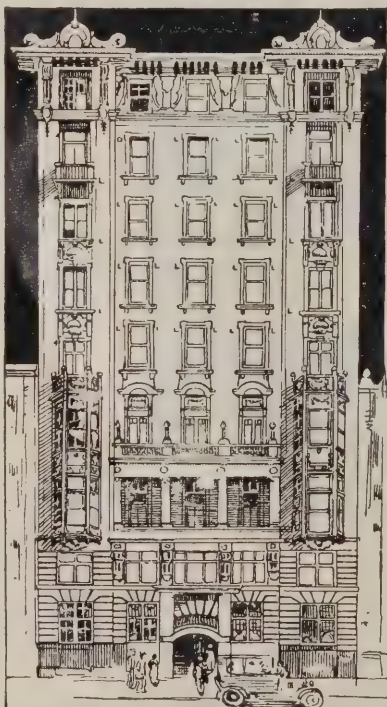
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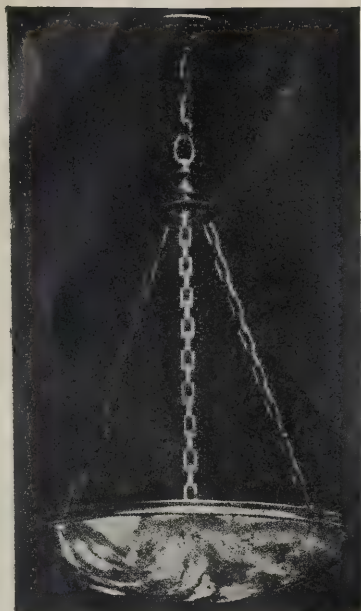
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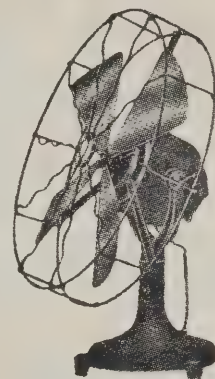
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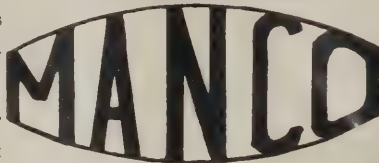
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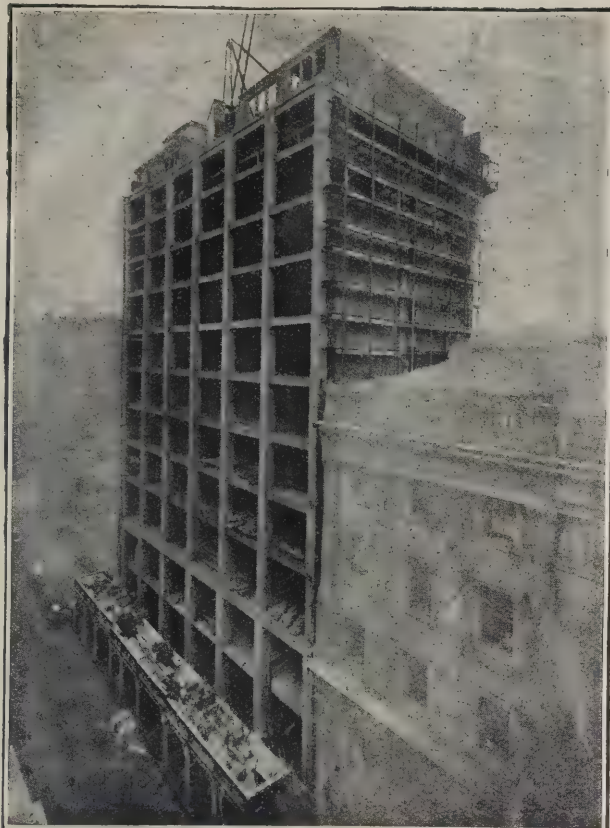
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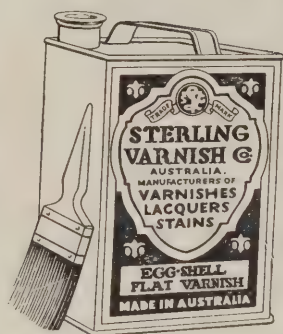
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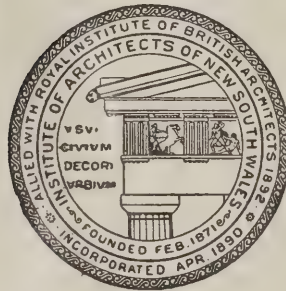
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ARCHITECTURE

THE JOURNAL OF PROCEEDINGS
OF THE INSTITUTE OF ARCHITECTS
OF NEW SOUTH WALES



FEBRUARY 15TH
1924

VOL 13. No. 2

PRICE ONE SHILLING

MINUTES OF AN ORDINARY GENERAL MEETING

OF THE INSTITUTE OF ARCHITECTS OF NEW SOUTH WALES

Held at the Royal Society's Rooms on Tuesday, 11th February, 1924

THE PRESIDENT, SIR CHARLES ROSENTHAL, F.R.I.B.A., occupied the chair.

Minutes of meeting of December 11 were confirmed.

The President announced that a ballot was to be taken, for the election of two Fellows, and Mr. W. De Putron and Mr. Lewer were appointed scrutineers. The election of Mr. William Arthur Nelson as a Fellow had been proposed by Messrs. Spain and Anderson, and the election of Mr. Norman Weekes, the City Surveyor, had been proposed by the President, and approved by the Council. It was announced at a later stage in the meeting that Messrs. Nelson and Weekes had been unanimously elected.

The Chairman read apologies from Professor Wilkinson, Colonel Vernon, and Mr. Peddle, for non-attendance.

THE PRESIDENT.—A week or so ago I visited Melbourne as a delegate to the Federal Council at its Annual Meeting. A copy of the proceedings has just been received to-day. This was the first occasion on which every State of the Commonwealth was represented, including Queensland, which had hitherto held somewhat aloof, and Western Australia. Mr. Godsell resigned his position both as President and also as a member of the Federal Council as representing New South Wales. Members of the Federal Council unanimously felt that Mr. Henderson should be President for the ensuing year. As he is a Melbourne resident, he nominated his own Secretary, Mr. Hudson. Mr. Waterhouse will, therefore, no longer be acting. The Federal Council will meet in Sydney next year. I tried hard to get the meeting fixed for Western Australia or Queensland. It was, however, pointed out that for a number of delegates to travel so far would incur very heavy expense. The President, Mr. Henderson, will, however, be visiting Queensland and the West.

I had the opportunity of meeting the Federal Minister of Works at Canberra, when a suggestion was put to him that in order to help our work generally at Canberra, something might be done in the way of variation of colour in the materials being produced.

The Manager of the Works has prepared a number of sample tiles and bricks of varying shades, which will give variety in legitimate construction. The Minister gave authority for certain of these materials to be put in hand.

The Federal Council decided that a levy should be made this year of 5/- per member. It has been found that the expense involved necessitates this. It is in lieu of the original method of financing the Federal Council.

Mention was also made of the keen desire on the part of members of the profession that we should have a Federal Institute of Architects as soon as possible. The Engineers have already succeeded in doing that, and it was felt that the time was ripe for further action on the part of the Architects.

To-day was the closing date for nominations to the various offices for the ensuing year. The only nomination received is that of Mr. Allan M. Hodgson as a member of the Council. Either the members of the Institute are very satisfied with their present team, or else they are not taking very much interest. I think we will assume that it is the former.

Mr. W. O. ENGLAND, A.I.A.—
Mr. President and Gentlemen,—

There is a matter which I would like to bring forward to-night, dealing with a proprietor's liability on a contract, as I feel that there may be some of our members who are not conversant with the Act governing this.

I refer to Section 16, Industrial Arbitration Amendment Act of 1918, which lays down that any workmen employed on a contract who have not received their wages in full can sue and recover from the building client the amount of unpaid wages due or alleged to be due.

This, I think, leaves a loophole for the unscrupulous tradesman who is in possession of this knowledge, because, failing the building proprietor or the architect acting on his behalf being able to produce documentary evidence to the effect that all wages in connection with the contract have been paid in full, the tradesman could sue and recover from the proprietor.

To safeguard our clients against this eventuality, I think it would be a wise precaution to insert in our contracts a clause something on the following lines:—

NOTE.—ON completion of work the contractor must furnish to the architects a certificate stating that all wages in connection with this contract have been paid in full as per award rates, and, further, he must obtain similar certificates from all his sub-contractors, setting out that their employees on this Contract have been paid all wages in full, and lodge these certificates with the architects.

No final certificate to be issued until this has been done.

I might point out here that should a contractor or sub-contractor make a false declaration in these certificates, he renders *himself liable to a penalty of £100 or six months.*

It was decided to refer this question to the Practice Committee.

THE PRESIDENT.—Following up the general policy of the Institute, which, I take it, is to learn all

we can about the materials in daily use in our various callings, we have asked Mr. Kneeshaw, representing the Kandos Cement Co., Ltd., if he would give us an address illustrative of the development of the cement industry in Australia. This invitation was the direct outcome of a recent visit to the Kandos Cement Works. The Company was very generous, and met the whole of the expense, including train fares, and Mr. Kneeshaw accompanied us, and made the day a very interesting one. We felt that the knowledge he has might, with very great advantage, be imparted to a larger circle than those who attended the Works. Incidentally, I might say that one is always very gratified to see one of our returned men holding a position such as Mr. Kneeshaw holds to-day. I am only sorry that more members are not present, but what we may lack in numbers, I am sure we will make up in appreciation. At the same time,* also, we publish these lectures in our Journal, and members who are unavoidably absent will therefore get a good idea of the lecture.

Gentlemen, I have much pleasure in introducing Mr. Kneeshaw, and asking him to address you. (*See page 16*)

INSTITUTE LIBRARY

Library Rules for Borrowers.

1. If a book is lost or stolen from a borrower, or if the same is not returned by him within fourteen days, from the date of issue, he shall replace it, or pay to the Council the full value of such book. In case of the book being part of a set or series, and the borrower neglecting to return the same within fourteen days as aforesaid, or being unable to replace the same, in consequence of its having been lost or stolen, he shall pay to the Council the full value of the whole set or series.

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In cases where the book is replaced the borrower shall be entitled to the injured book.

4. A borrower shall be entitled to borrow only one book at a time, but at the discretion of the Council two volumes of one work may be issued at the same time.

5. A borrower shall return any book borrowed at the latest within fourteen days after the date of issue; but books may be renewed upon application at the discretion of the Council.

6. If a book is not returned within the time prescribed by the preceding rule, the borrower shall pay the sum of sixpence for each and every day the book is retained beyond the prescribed time.

7. Certain volumes may not be removed from the Library, and are for reference only.

THE COMMON ROOM.

The COMMON ROOM at the INSTITUTE OF ARCHITECTS is available for Arbitrations' Consultations and the like.

Terms on application to the Secretary.

THE MANUFACTURE OF PORTLAND CEMENT IN AUSTRALIA

A LANTERN LECTURE

By Mr. F. P. Kneeshaw, Kandos Cement Co. Ltd.

ABOUT three months ago your President, accompanied by several members of your Council, visited the works with which I am associated, and during the visit instructed me to deliver this evening's lecture with a view to promoting a better general knowledge of the industry.

Before proceeding further, I would like to express my deep appreciation of the honour of appearing before you.

The manufacture of Portland Cement—which, by the way, is *not* only carried on in the many towns bearing the name of Portland—covers such a large field, and the problems encountered are so varied, that it is only possible to give a general outline in one evening. Should you desire to go more deeply into the various processes, there will be no difficulty in obtaining detailed and specialised papers.

Importance of the Industry.—During the recent war a great deal was said and written about the importance of fostering the key industries of Australia. The most important of these may be classified in order of importance as follow:—

The manufacture of Steel.

“ “ “ Cement.

“ “ “ Non-Ferrous Metals.

The lessons of the War are rapidly being forgotten. The SLIDE No. 1, which illustrates the importations into the Commonwealth, shows how greatly Australia was dependent on local industries, even with Japan, as a friendly Power, exporting large quantities into this country. Unfortunately, reliable figures of the total production in Australia for the same period appear to be unobtainable. It is interesting to note that from 1903 to the outbreak of war Australia paid Germany £1,250,000 sterling for Portland cement.

Historical.—The early history of the industry is fully described in *Mineral Resources No. 25—The Limestone Deposits in N.S.W.*, an excellent volume, published by the Mines Department, N.S.W. It is interesting to note that Portland cement was first successfully manufactured in Australia by Messrs. Goodlet & Smith, Ltd., at Granville in 1891, who also erected the first plant on present-day practice in 1901, followed by the Commonwealth Portland Cement Co., in 1902. These were installed before any plants of similar type were erected in England.

Capital Value of the Industry.—The actual paid-up capital invested in the industry is between £3,750,000 and £4,000,000. This is exclusive of reserves and bank overdrafts.

Capacity of Plants.—The plants actually in operation or in process of erection are capable of producing 730,000 tons per annum, or, on the basis of a population of 6,000,000, 2¼ bags per head of population per year, which is the rate of consumption in the United States. The rate of consumption in Canada is 1 7-8 bags per head.

So far as New South Wales is concerned, the machinery at present actually operating or in process of erection is capable of producing 430,000 tons yearly, which, on the last census of 2,200,000 inhabitants, equals slightly over 3½ bags per head.

The figures mentioned are all corrected to a basis of 18 bags to the long ton, and are exclusive of cement imported into the Commonwealth.

Slide No. 2 shows the production in, and the importations into, New South Wales from 1903 to date. The figures for 1923-1924 and 1924-1925 have been conservatively estimated from the capacity of plant installed or in process of erection. This slide clearly shows the set-back the industry received from the war and the 1917 strike. It also shows how production was affected by the drought of 1919-1920, and the effect of the installation of a satisfactory system of water supply to the Kandos works in 1921.

The recent rapid rate of expansion of output which commenced in the second half of 1920 will, by the first half of 1925, exceed the average rate of expansion maintained until 1914, and over-production will undoubtedly be experienced.

Slides Nos. 3, 4, 5, 6, and 7—Views of Various Works.

Raw Materials.—With the exception of the most important one, Australia has been well provided by nature with abundant raw materials. The process requires ample good water, carbonate of lime, coal, shale and gypsum. These have been mentioned in order of importance.

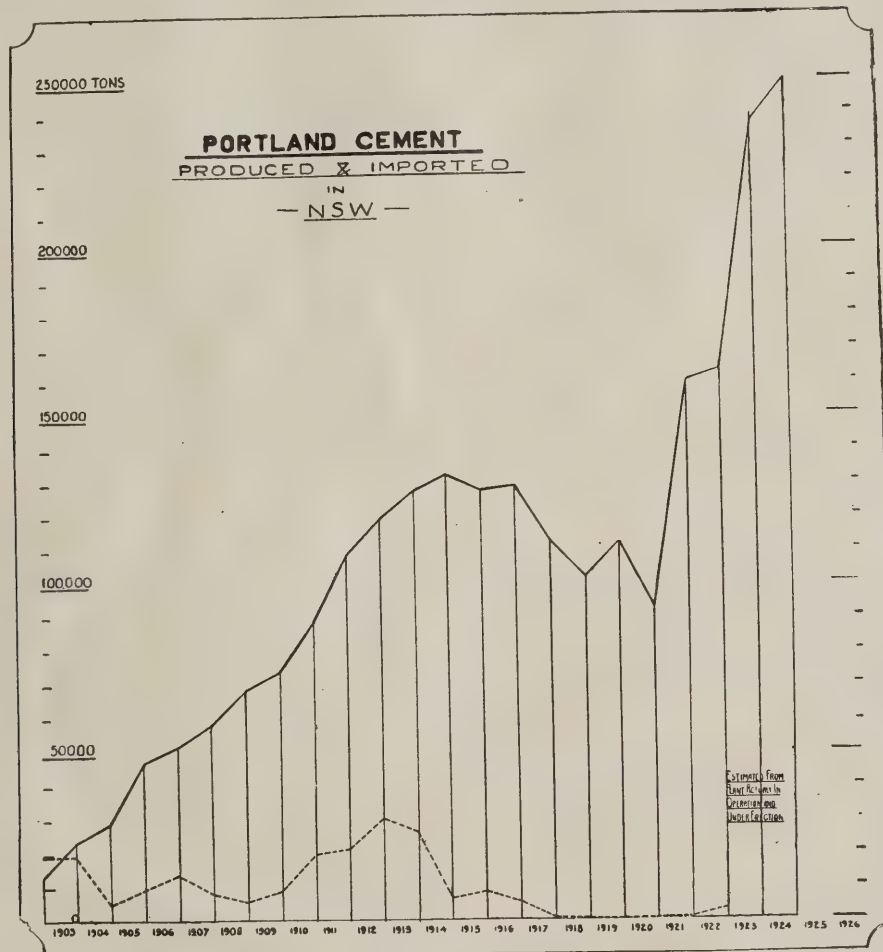
None of the other materials are of the slightest use without ample supplies of good water. There are innumerable creeks in the limestone belts which contain

highly mineralised water, and the oldest inhabitant, who is usually most unobservant, will confidently assure one that they never run dry, but a very small pump running twenty-four hours per day and seven days per week, as is the case in cement manufacture, would soon drain them. In the majority of cases the water contains such a high percentage of mineral solids that it destroys steel work, such as pipes and boilers, and the cost of treating it, if the quantity were available, would be very heavy.

Gypsum is obtainable in most of the States, but the bulk of it is drawn from South Australia.

Processes of Manufacture.—The processes employed may be dealt with under the following headings: Quarrying, Transportation, Crushing, Mixing, Grinding of Raw Materials, Burning, Grinding of Clinker—which is the product of the burning process—Bagging, Testing, and Power Supply.

Quarrying.—With the exception of the Company in Western Australia, the whole of the raw material is



The carbonate of lime exists in limestone of various geological ages, marls and shell deposits.

Shale of suitable analysis is usually readily obtainable, but one company in another State has had considerable trouble in this direction. The colloidal condition of some of the shales renders them difficult to use under the wet process.

The Eastern States, and New South Wales in particular are very fortunately situated in regard to supplies of coal. The West Australian Company has been successful in its experiments with Collie coal.

won by quarrying.

The West Australian Company was for some time working a lake of marl by means of a dredge, but the material was found too difficult to treat as a commercial proposition, and various other deposits were then worked by quarrying. A deposit of decomposed shell has now been found adjacent to the works, and arrangements are in progress to win this by dredging.

The quarries of the other companies vary greatly in formation and operation. Some companies are working material which is below the general level of the

ground, and some work deposits which are above ground. Some of the deposits are covered with overburden and some are outcropping. Some of the material is almost as hard as basalt, and some comparatively soft. Some of the formations are solid, and some have been shattered by earth movement and water-worn into boulders.

Slide No. 8.

This slide illustrates a quarry with heavy overburden, but above the general level of the ground, so that no pumping is required. The material is soft, but of solid formation. This is situated $3\frac{1}{4}$ miles from the works.

Slide No. 9.

This slide illustrates a quarry with a little overburden and with the floor so much below the level of the ground that were it not for the broken nature of the country, which naturally draws any surplus water into fissures in the ground, pumping would be necessary. The material is hard, but badly broken. This is situated 200 miles from the works.

Slide No. 10.

This slide illustrates a quarry with slight overburden and with hard, solid formation. As the floor is considerably below ground level, pumping is employed. This is situated a few hundred yards from the works.

Slide No. 11.

This slide illustrates a self-draining quarry with hard, solid formation and practically no overburden. This is situated three miles from the works.

When overburden occurs to such an extent or of such a nature as to necessitate removal, this is done either by steam shovels or by hand, depending upon the size of the plant. Sufficient stripping must be done in advance of the face to prevent the overburden from falling back or being washed by rain on to the quarry floor.

Slide No. 12.

Drilling.—When the limestone is naturally comparatively free from overburden or has been stripped, it is drilled by various drills, depending on the height of the face, and then shattered by explosives, the type of which is governed by the solidity and hardness of the deposit.

When the face exceeds approximately 30 feet in height and the limestone is of solid formation, the most modern practice is to use a well-drilling type of drill, generally referred to as a churn drill. These are usually electrically operated, and on level ground may be self-propelling. The slide on the screen shows two of these drills in operation on a face approximately

140 feet in height. At the foot of the face is seen about 30,000 tons of broken stone.

Slide No. 13.

This slide shows a close-up view of one of these drills. These machines are capable of drilling holes six inches or more in diameter to a depth of 200 feet.

With this type of drilling there is no necessity for bulling or chambering the bottom of the hole to provide room for the necessary amount of explosive, which is a slow and not particularly safe operation.

Usually one row of holes is drilled to a depth below the quarry floor, depending upon the burden to be moved, although two or more rows may be drilled and the lot fired at the one time. The reason for drilling below the floor is to prevent the formation of a toe, which interferes with the shovel and also imposes too much burden on the next shot. A toe always occasions delay, as it must be moved before the next shot can be fired.

Slide No. 14.

Explosives.—The holes are loaded at various heights, depending upon the burden to be moved. This slide shows the method of loading for a blast carried out last year when there was a toe, accompanied by a fault at a time when supplies were short. Under normal conditions the explosive would be more distributed.

Slide No. 15.

Care and experience in charging the holes are necessary to obtain the best shattering effect and to keep down the cost of the secondary explosives.

The amount of explosive used for primary blasting varies in practice from $3\frac{1}{2}$ to 6 pounds per ton of stone moved. The quantity for secondary blasting depends upon the method of handling, *i.e.*, whether mechanical or hand loading is employed.

Some companies use a quick-detonating fuse, known as Cordeau Bickford or Countered Cordeau. The former is a plain lead tube filled with a high explosive, and in the latter the lead is covered with a cotton braiding. One end of each length is inserted in the mass of gelignite. The other end is split with a knife and wrapped around the main connecting length. This length is fired with an electric detonator. The average rate of detonation of this fuse is 17,056 feet per second, and I have never experienced a misfire with it. It has the further advantage of being absolutely safe, and can be carried by passenger train.

The slide on the screen shows the quarry face before a big blast. The clean floor is most noticeable.

Slide No. 16.

This slide shows the blast taking place. The escape of the gases can be clearly seen.

Slide No. 17.

This slide shows the stone shattered and fallen.

To break this stone down to a suitable size for shovels, "Jack Hammer" drills, generally known as Poppers, are used for drilling for the necessary explosive. These are pneumatically operated. The holes are fired in batches at fixed times daily.

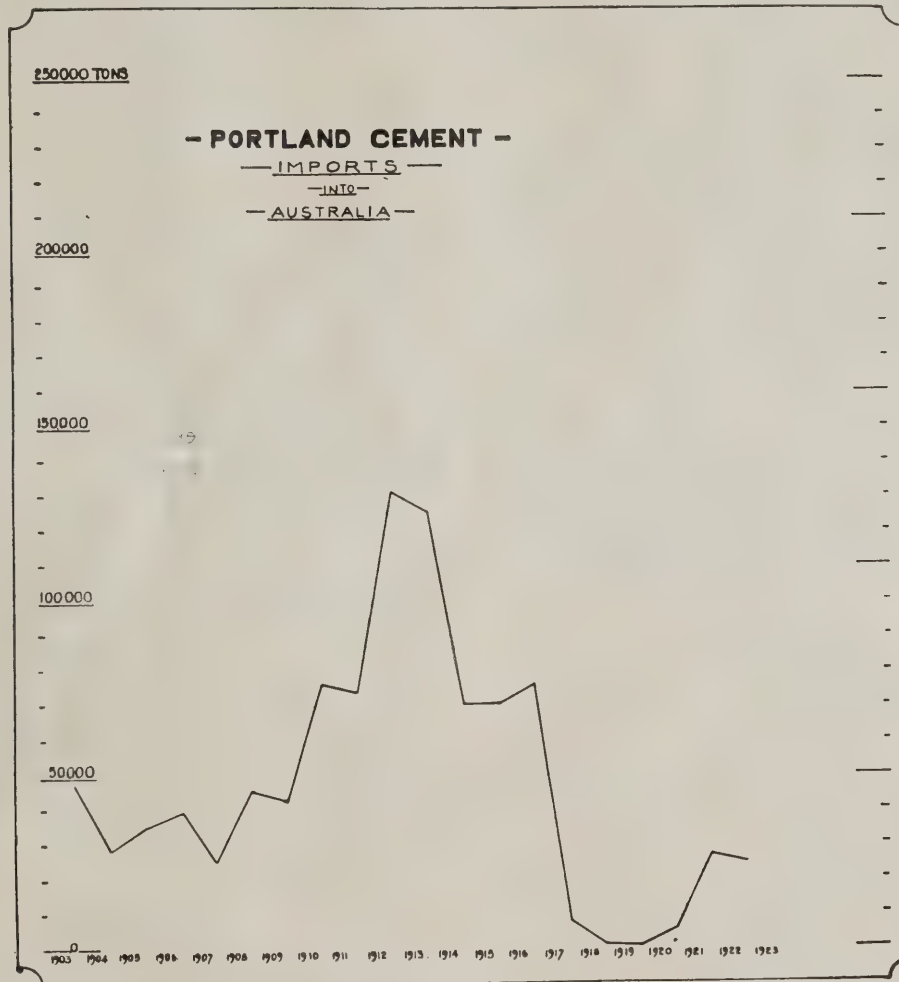
When the face is below approximately 30 feet, Tripod pneumatic drills are used for drilling for the

loaded skips of three-quarter or one yard capacity to transport the stone to the crusher.

The stone requires to be spawled to about 9in. for hand loading.

This slide illustrates a hand-loading layout.

Shovels.—Plants of larger output use mechanical shovels or a combination of mechanical and hand loading.



primary blasting. These machines drill holes varying in diameter from three inches downward, which are frequently bulled to provide additional room for the explosive.

The secondary shooting is carried out as previously described.

Transportation.**Slide No. 18.**

Hand Loading.—Plants of small capacity requiring about 400 tons or less of stone per day, use hand-

The mechanical shovels vary in capacity from 2½-yard dippers down to as small as 2/3rd yard, although one Company is now negotiating for an electrically operated machine, which is designed to take a 5-yard dipper, but which will be used with one of 3½ yards capacity until the output necessitates a larger size.

Slide No. 19.

Steam shovels are the more general, but during the past few years great developments have been made in the design of electric shovels, which, although higher

in first cost, as compared with the steam type, are less costly in maintenance, and also require less labour for operation.

Another great development in shovel practice has been the adoption of the caterpillar track, which has greatly added to the flexibility of the machine, and reduced the labour required for operation. This type of mounting also minimises the risk of damage by fall of stone, as the machine can be quickly backed away on the first sign of a fall.

This slide illustrates a shovel mounted upon rails. The limitations of the track and want of flexibility are clearly seen.

Slide No. 20.

Shovels of the full revolving and also of the railroad type are used. The former will swing through 360°, the latter through approximately 180°. The railroad type is much the more rugged, and the whole weight is not required to swing, while it is available to react against the thrust. It may be fairly claimed that the railroad type is the better practice for stone, and will show the lower maintenance cost.

This slide shows a 2½-yard revolving steam shovel, mounted on two caterpillars. This particular machine has only been in service a few months, and embodies the latest British practice. It is a splendid mechanical job, but from an architectural view, its appearance has been somewhat marred by the addition locally of a hardwood protection against flying stone from popping.

Slide No. 21.

This is another view of the same shovel in the act of filling horse-drawn skips.

Slide No. 22.

This slide shows a 2½-yard electric railroad type shovel, mounted on three caterpillars, which embodies the latest American practice.

Slide No. 23.

This is a rear view of the same shovel.

Slide No. 24.

This is a view of a substation for an electrically equipped quarry.

Slide No. 25.

Trucks.—For transportation from the shovel to the primary crusher, trucks of capacities varying from 12 cubic yards downwards are employed. These are usually horse-drawn, but at one New South Wales quarry, electric locomotives are employed, which run on 60lb. rails, with a gauge of 4ft. 8½ins. Each locomotive weighs 8 tons. The trucks in this particular case are most interesting. They have a carrying capacity of 12 yards, and are designed to reduce the

cost of maintenance to a minimum. The bodies consist of double steel shells separated by three-inch hardwood timber, which acts as a cushion. The doors are designed to lift over the body before the latter commences to tip. This removes one of the greatest causes of high maintenance, *viz.*, damage to doors by falling stone. The door lifting and body tipping are effected by means of a 15-ton overhead electric travelling crane, which is also available for quick handling of the crusher parts for overhaul.

This slide shows these trucks being loaded.

Slide No. 26.

This slide shows door open.

Slide No. 27.

This slide shows the body in the act of tipping.

Slide No. 28.

This shows the stone falling on to the crusher feeder. Stones up to 3 tons in weight are easily handled.

Primary Crushers.—When power shovels are used, the primary crusher should be of the jaw type, and in deciding upon the size, consideration should be paid to the input, not, as is usually done, to the output. The jaw opening should be amply large to take the feed from the trucks as fast as they can be tipped, without bridging or choking. To assist the crusher, an apron feeder should be installed, which is seen in the slide still on the screen. This feeder consists of a belt of heavy cast steel links, which is controlled by a friction clutch and which maintains an even feed to the crusher.

Slide No. 29.

This slide shows the largest crusher used on limestone in Australia. The jaw opening measures 5 feet by 4 feet, and the machine has given so much satisfaction that two similar machines have been bought for crushing basalt. This view is from the driving side, and shows the motor as well as the hopper over the apron feeder.

Slide No. 30.

This view shows the drive of the apron feeder and also the belt carrying the crushed stone to a secondary crusher.

Slide No. 31.

Another view of the same belt, which is four feet wide.

Slide No. 32.

Ropeways.—Where the quarry is situated less than approximately five miles from the works, the stone is usually conveyed by aerial ropeway or ropeways. In South Australia it is conveyed by lighter, and in Queensland by the Government Railway. The stone for the new works at Boolaroo, N.S.W., will also be conveyed by Government Railway.

This slide shows the belt leading from the crusher to the hoppers, over two ropeway loading stations.

Slide No. 33.

This slide shows a ropeway bucket being filled from a shoot at the bottom of one of the hoppers.

Slide No. 34.

This slide shows a loaded bucket leaving the loading station.

Slide No. 35.

This is a view along the ropeway route, looking towards the works.

Slide No. 36.

This slide shows stone being tipped at the factory. It also shows the concrete tunnel which houses a belt, to enable the stone to be drawn from the pile to supply the secondary crushers.

Slide No. 37.

Another view of the stone pile, which shows the elevators for raising the material from the secondary crushers to the hoppers over the weighing machines.

Slide No. 38.

Before dealing with the Works themselves, brief reference must be made to the shale supply.

Generally, there is no difficulty in obtaining ample supplies of suitable shale at no distance from the Works, although I understand one company in another State, is having great difficulty. The amount of shale used is so small in proportion to the limestone, that mechanical handling has not been generally employed in this Department. The Queensland Company uses a mechanical elevator type of loader, and the two New South Wales companies are now considering electric shovels.

This is a view of a shale quarry. The material is shot down, and at present, is gathered by hand.

Slide No. 39.

This is a plan and elevation of a possible layout to illustrate the various departments.

Slide No. 40.

When we finished the slides of the ropeway, we had reached the weighing station hoppers. This slide shows a weighing station and the raw material being conveyed from it.

It is here that the only great difference occurs in the methods of manufacture.

There are two processes used in the mixing and grinding of the raw materials, one known as the wet process, and the other the dry.

Slide No. 41.

Under the wet process the shale is delivered into wash mills, where it is mixed with a definite propor-

tion of water, and in which it is broken down by horizontally revolving paddles. From the wash mills it is conveyed to the raw mills, into which it is weighed with the requisite amount of limestone or shell.

After being ground in the mills the material, known as slurry, is stored in slurry tanks for analysis and for blending, if necessary, after which it is used to feed the kilns.

This slide shows wash mills and slurry tanks in a small plant.

Slide No. 42.

Another view of these.

Slide No. 43.

This shows a slurry tank in a large plant. Slurry must be continually agitated to prevent segregation. This is effected by air or by mechanical means, and sometimes by both means.

Slide No. 44.

The slurry is pumped, or gravitates to the kilns. This slide shows a slurry pump.

Numerous doubtful advantages are claimed for the wet process, but the fact remains that the best cements in Australia, are those made in New South Wales under the dry process.

Slide No. 45.

Returning to the belt from the weighing station. This shows a mixture of limestone and shale being conveyed to an elevator, after being carefully mixed in proper proportions by weight.

Slide No. 46.

The mix under the dry process is fed into a rotary drier, where the moisture is removed to facilitate grinding. This slide shows a small coal drier, but will serve to illustrate the type of machine. The drier is inclined downwards towards the discharge end, and the material passes in the opposite direction to the hot gases, generated in a furnace at the delivery end. A large dust chamber at the feed end causes the gases to expand, and drop the greater portion of their dust, due to their decrease in velocity.

Slide No. 47.

Raw Mills.—The dried material is then conveyed to the raw mills, or, in the case of the wet process, the product of the wash mills and the necessary limestone.

The material is first broken down in ball mills with steel balls of three, four, or even five inches in diameter, and is then ground in tube mills until, under good practice 90 per cent. will pass through a sieve, having 32,400 meshes to the square inch.

This slide shows a ball mill and a tube mill in a wet process plant.

Slide No. 48.

Under modern practice the two mills are combined in one shed, with diaphragms dividing it into two or more compartments. This slide shows a combined mill, which happens to be one used for grinding cement, and is 36 ft. long by 6ft. 6ins. internal diameter. It is divided into four compartments, as shown.

For raw meal grinding, a mill, 28 feet long, divided into three compartments, is quite satisfactory, as the raw material is easier to grind than good, hard clinker.

The raw meal is conveyed to silos, or the slurry to tanks for blending, if necessary. It is important that the kiln feed should be uninterrupted, and sufficient storage is necessary to tide over ordinary stoppages of the raw mills.

Slide No. 49.

Kilns.—This slide shows one of the largest kilns in Australia in course of erection. It is to be used under the dry process, and is 160 feet long by 10 feet diameter.

Slide No. 50.

This slide shows a kiln with a rotary cooler for cooling the clinker. This kiln is used under the wet process.

Slide No. 51.

This slide shows a modern dry process kiln room with four kilns used under the dry process. Three of the kilns are 8 feet in diameter, and one 9 feet. They are all 141 feet long. They have no coolers.

This view is looking towards the feed end. Raw meal is admitted, and the feed regulated by rotating screw extractors fitted to hoppers over the dust chambers. Due to the slight inclination of the kilns the meal travels slowly down to the firing end, taking about two hours on the journey.

Slide No. 52.

Passing through the hood at the firing end, shown on this slide, is a pipe through which a combustible mixture of air and pulverised coal is blown by a fan. This ignites on entering the kiln, and raises the temperature to 2,500° to 2,700° F., dropping to a temperature at the feed end, depending on the process, length of kiln, and nature of the raw mix.

Waste Heat Boilers.—Most of the companies are considering utilising the waste heat from the kilns for the generation of steam for power purposes, but this subject is too large to go into to-night.

Pulverised Fuel.—We must pass over the coal milling department, which is very similar to the raw mill.

Slide No. 53.

Clinker.—After passing through the kilns, the material is called clinker, and is conveyed to a storage

pile, as shown on this slide. This clinker has to be stored for some weeks to mature, to ensure sound cement. This locks up a lot of money, but is unavoidable.

Slide No. 54.

The clinker is drawn from the pile and conveyed to the cement mills, by a belt in a tunnel under the heap. This slide shows an electric grab crane lifting the wings of the heap and dropping the material over holes in the top of the tunnel, leading to the automatic feeder over the belt.

Slide No. 48 again.

After maturing, the clinker is conveyed by the belt to the cement mills, during which journey a small percentage of gypsum is added to regulate the set of the cement. This slide shows our old friend, the cement mill, which has already been explained.

Slide No. 55.

Silos.—After being ground in the cement mills to a degree of fineness prescribed by the British Standard Specification, *viz.*, so that the residue after sieving through a sieve, having 32,400 meshes to the square inch, does not exceed 14 per cent., the cement is conveyed to silos for testing purposes. This slide shows a group of silos under construction, as well as the conveyors leading from the cement mills. There are now sixteen silos in that group.

Slide No. 56.

Bagging.—The cement is almost invariably bagged by Bates' bagging machines, one of which is illustrated on this slide. This machine will weigh and seal at the rate of ten bags per minute.

The slide also shows the belt for conveying the bags to the railway trucks.

Testing.—Time does not permit of going through the testing department in detail. It is sufficient to observe that it is almost the universal practice to sample each mill and kiln hourly, and these samples are all run through physical and chemical tests in the laboratory, to keep a careful check on the quality of the material produced in each department, as well as of the finished product. It is practically an impossibility for bad cement to be made, let alone leave the works. Notwithstanding this, the cement is the first suspect when trouble occurs on the job, although bad sand, too much water or improperly graded aggregate, or even at times, a combination of the lot, cause all the troubles. One would need temerity bordering upon rashness, to suggest in your company the possibility of bad design causing troubles.

I, however, seriously recommend for your consideration the submission to your Institute of a paper on the

preparation of concrete aggregates by, say, Mr. Morrison, of the Public Works Testing Branch.

Slide No. 57.

Power.—This subject must be passed over quickly. This slide shows the turbine room of a model cement works power house, with a total generating capacity of 6,000 horse power.

Slide No. 58.

This shows another view of the same power house, with a reinforced concrete stack, having six-inch walls 173 feet high by 11 feet diameter. It also shows the sprays for cooling the condenser circulating water.

You will see that justice cannot be done the industry in one evening, but I have done my best to convey a good, general idea of the plant used, and of the various processes. It will be seen that the local manufacturers are keeping pace with development abroad, and are endeavouring to counteract their high labour charges by using the latest mechanical contrivances. It should also be remembered that steel is one of the large factors in the cost of manufacture, and local manufacturers have to pay as much as 50 per cent. to 75 per cent. more for this than Oversea manufacturers.

The cost of concrete is not solely dependent upon the cost of cement, and the local costs could be considerably cheapened by the use of the most modern appliances.

Slide No. 59.

This slide shows one of the first serious efforts to reduce the cost of concrete roads. This shows the mixer which Concrete Constructions, Ltd., are using on the Botany Road, with one of the twelve Fords tipping a measured batch of metal, sand and cement.

Slide No. 60.

This shows another view of the mixer, illustrating the travelling spreader.

Even with this up-to-date plant, the cost of the cement is only about one-quarter of the total cost of the job.

COLONEL SPAIN: Mr. Chairman and Gentlemen, you will agree with me that we have this evening listened to a very interesting lecture. I do think that the Institute of Architects are much indebted to Mr. Kneeshaw, for the trouble and research work he has gone into. Unfortunately, I was not able to be present at the late inspection of the works. I may say, however, that I had the privilege of recently going through the Portland Cement Works, at Geelong. All I can say is, that I was very interested with the work that I saw in Victoria. After seeing these slides to-night, and the ramifications of the Cement Company, I cannot speak too highly of the manner and method in which

Mr. Kneeshaw has delivered his lecture, together with his explanation of the magnificent pictures shown, per medium of the slides. Beyond all doubt, the works and the products of those works have played a very important part in the progress of the State, and we are indebted to Mr. Kneeshaw for coming here to-night, and being able, not only to explain in detail the layout of the works, but on top of that, to carry on a wonderful explanation of the general manufacture of the product and commodity which those works turn out.

I am sorry, Mr. Kneeshaw, we have not a better attendance. We are much indebted to you, and I, as the Vice-President of the Institute, feel it a privilege to offer to you a deep sense of our appreciation. I have much pleasure in moving a hearty vote of thanks.

MR. S. M. MOULD: I have very much pleasure in seconding this vote of thanks. When one listens to such a lecture as we have heard to-night, one cannot help taking into comparison the enormous output of these works to-day, as against the situation of cement production at a time when we were serving our articles. I come from the north of England, and there was in Newcastle at that time, a man who was regarded as something of a crank—Mr. Potter. Potter's text-book was then one of the standard text-books, but in his own land, I suppose on the general principle that a prophet has no honour in his own country, he was more regarded as a curious crank than a man who was a pioneer of such a huge industry. With the enormous buildings that are now put up, sometimes entirely of reinforced concrete, we have, as Architects, almost passed into an altogether new phase of work. I had not the opportunity of going through the works, but really, with the help of our lecturer, I think I have not lost very much, because all through the most interesting fact is to see the mass of thought that has been exercised from the beginning, in quarrying the raw material, right down to the finishing of the product. It is interesting to find that all these details are controlled by expert men, even to the taking away of the material and the caterpillar wheels. It is certainly a pleasure to listen to such a lecture, and it is also invaluable to an Institute like ours. I have much pleasure in seconding the vote of thanks to the lecturer.

Members requiring Assistants in their office or who are willing to take on a Learner are requested to communicate with the Secretary, Institute of Architects, 5 Elizabeth Street, Sydney.

MR. W. DE PUTRON, F.I.A.: I have much pleasure in supporting the vote of thanks. I think lectures of this kind mean a great deal to the Institute of Architects. We specify certain articles for our buildings, but we have often not the faintest idea how they are manufactured. This lecture gives us an idea of what we are specifying. Unfortunately, I was not able to attend the visit of inspection to the Kandos Works. To-day, as Mr. Mould has mentioned, with the amount of concrete work that is being done, it means a lot to us to be able to satisfy ourselves that the cement we are using is properly prepared before it comes into use. A number of municipalities to-day are also going in for concrete construction, as far as road making is concerned, and it is only a matter of time when the old macadamised roads will be dispensed with, and cement will play a very important part in the near future. I have very much pleasure in supporting the resolution, and feel that the instruction and information given to us to-night, is most valuable from every point of view.

MR. W. POOLE, M.I.C.E.: Mr. Chairman and Gentlemen, I have listened with much pleasure to Mr. Kneeshaw's interesting lecture. The subject is one of special interest to most engineers, and probably to some who are concerned not only in the uses, but also in the handling of the materials and the preparation of the finished article. There is one remark made by Sir Charles Rosenthal at the beginning, to which I, as Chairman of the Sydney Divisional Institute of Engineers, might allude, although it is a little bit removed from the subject of the lecture. Sir Charles said that the Architects would probably federalise their Institute within a very short time. As some of you know, there is an Engineering Council, but there is no reason in my mind why that particular body should not be very soon known as the Council of Technical

Societies, in which Mining Engineers and others, Technical Chemists, and we hope also, the Architects and Surveyors may come in. There are a great many ways in which a body like that, would be of great value in furthering the common interests of all these technical bodies. I thank you, Mr. Chairman, for allowing me an opportunity of speaking on this matter, which I think is of importance, and also of expressing my appreciation of the lecture we have heard to-night.

MR. LEWIS (Managing Director of Concrete Constructions, Ltd.): Mr. Chairman, I would like to say how interested I have been in the lecture delivered by Mr. Kneeshaw. I have seen the Kandos Cement Works quite a number of times, and have taken a good many thousands of pounds from that Company, in carrying out work for them. Although I have been through their works many times, I did not realise even the amount of care that is exercised in the manufacture of cement. Probably my Company is one of the largest users of cement in New South Wales to-day, and in one contract we are carrying out, we are using something like £30,000 worth in a £150,000 contract. I am referring particularly to road work. I believe that concrete is going to be a big building material for road making in the future, and, of course we all know that in building work, concrete appears to have come to stay. I can only say that I have been very interested indeed to-night. I take this opportunity of congratulating Mr. Kneeshaw on being the head of those enormous works.

THE CHAIRMAN then formally conveyed to Mr. Kneeshaw the vote of thanks.

MR. KNEESHAW, in returning thanks, drew the attention of the audience to a series of bottles on the table, showing every stage the cement went through from the beginning to the finished article.

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The Directors of Farmer & Company, Limited, in conjunction with the Sydney Regional Plan Convention, have pleasure in inviting you to an Exhibition of Plans and Photographs, illustrating civic pride and progress in various parts of the world, with special application to the growth of Sydney, and stressing the urgent need for comprehensive planning for the City's future.

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CORRESPONDENCE

January 4, 1924.

Dear Sir,—

"R.I.B.A. Journal" and the Allied Societies.

I enclose a copy of a letter, dated May 23, 1922, which I wrote to you in connection with the *R.I.B.A. Journal* and members of the Allied Societies. I shall be much obliged if you can kindly take steps to bring these specially reduced terms to the notice of those of your members who are not members of the R.I.B.A.

Yours faithfully,

IAN MacALISTER,
Secretary.

(Copy.)

May 23, 1922.

Dear Sir,—

It has occurred to me that many of your readers who are not members of the R.I.B.A. might be glad to be-

come regular subscribers to the *R.I.B.A. Journal* if it could be supplied to them on terms which would just cover the actual extra cost of printing and postage.

Apart from the matter of interest to architects generally which is contained in the *Journal*, it is now the regular medium for giving publicity to the proceedings of the Allied Societies, and its wider distribution would do much to maintain interest in their work and to bring their members into closer touch with one another.

We are now in a position to supply the *Journal* (post free) to the members of Allied Societies for an annual subscription of 12/-.

I shall be very much indebted to you if you will kindly bring this suggestion to the notice of your members. If it would be of assistance to you in this direction, I should be glad to send you as many duplicate copies of this letter as you wish.

Yours faithfully,

(Signed) IAN MacALISTER,
Secretary.

SCHEDULE OF WAGES AS PER AWARDS AND AGREEMENTS AND THE 44 HOUR PROCLAMATION

TABLE OF HOURS, WAGES, ETC.

Trade.	Country. 48 hours.	City and Suburban. 46 hours.	Date when takes effect.
Bricklayers	2/4¼	2/5½	Nov. 16, 1923
Builders' Labourers— (State)	2/0½	2/1½	Oct. 12, 1923
(Federal 44 hrs.) ..	—	2/3¾	Nov. 2, 1923
Carpenters and Joiners	2/27½	2/4	Oct. 12, 1923
Wharf Carpenters ..	2/3¾	2/47½	" "
Plumbers	2/27½	2/4	" "
Slaters	2/3½	2/4¾	June 22, 1923
Plasterers	2/3	2/4¼	" "
Painters	44 hours. 2/4	44 hours. 2/4	Nov. 2, 1923
Quarrymen	2/3¾	2/6½	May 25, 1923
Masons	2/5½	2/8	" "
Electrical Mechanics Railway, Roads, Bridge, etc., Labourers	48 Hours. 48	Wages. 2/2¾ 1/10½ and upwards	Nov. 1, 1923 Oct. 12, 1923

Trade.	Country. Hours.	City and Suburban. Wages.	*Date when takes effect.
Crane Drivers (Agreement) ..	48	2/8½	Sept. 21, 1923
Hoist Drivers ..	48	2/5½	" "
Builders' Carters	48	£4/7/6	Oct. 12, 1923
Machinists (Gen. Joiners)	44	£5/7/6 to £5/9/6	Nov. 2, 1923
Machinists (Labourers) ..	—	£4/8/6	" "

Price of Materials.

Bricks (Common) at kiln, per 1,000 ..	73/-
Cartage of bricks to site (as per current rate)	
Timber (Basic Prices)—	
Hardwood, per 100ft. sup. ..	31/-
Oregon	31/6
Redwood	70/-
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Richmond River or Hoop Pine ..	57/-
Cement, per three bags, according to quantity ..	22/6

Institute of Architects' Annual Exhibition, 1924 Model Competition

With the object of encouraging the making of models for the more complete study of work, the Council of the Institute offer a Prize of TEN GUINEAS (£10 10s.) for the best model of a building (not necessarily erected).

The Competition is open to all Members of the Institute and to all Students.

The Model must be entirely the work of the Competitor, or have been made in his office under his personal supervision.

The design must be original and the Model must show the whole building.

The Scale and Materials are left to the discretion of the Competitor.

The Models will be judged by the Selection Committee of the Exhibition, and their decision shall be final. Should the Adjudicators decide that none of the

Models submitted are of sufficient merit, they shall have the right to withhold the premium.

No name is to appear on the Model, but a declaration, signed by the Competitor, stating that the work is entirely original and has been done under his personal supervision, is to be enclosed in a blank sealed envelope and attached to the Model.

All Models must be delivered at the Institute's Rooms, 5 Elizabeth Street, Sydney, on or before 5 p.m., on 29th February, and must be removed on the day following the Exhibition.

All reasonable care will be taken, but the Institute does not hold itself responsible for any loss or damage.

The Exhibition Committee invites Architects to submit for selection A COMPLETE SET OF DRAWINGS, including preliminary sketches, working drawings and details of:—

(a) Residence.

(b) Commercial or Public Building.

The objects of this Exhibit are twofold. Firstly, to interest the profession generally, and secondly to demonstrate to the public the amount of study and work involved in designing a building.

The Drawings should not be mounted, but should be bound in sets so as to be easily handled and displayed.

They should be marked "Complete Drawings," and submitted not later than 5 p.m., on 29th February, 1924, addressed to the Exhibition Committee, at the Institute's Rooms, 5 Elizabeth Street, Sydney.

Attention of Members is also invited to the JOSELAND SKETCHING PRIZE for Students, the Conditions of which were published in the December issue of *Architecture*.

ANNUAL EXHIBITION

Members are again notified that the Annual Exhibition will be held from March 3rd to March 19th, 1924, in the Education Department Gallery.

Sending in day is the 27th February, 1924.

Please make a big effort to be represented.

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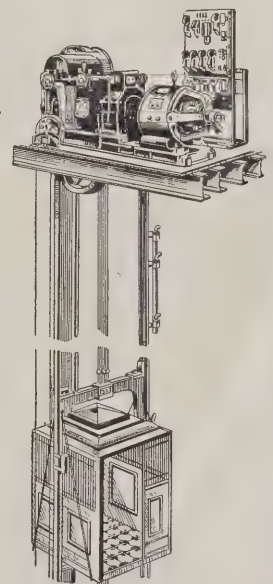
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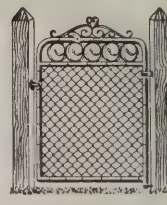
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MONARCH ELECTRIC MOTORS

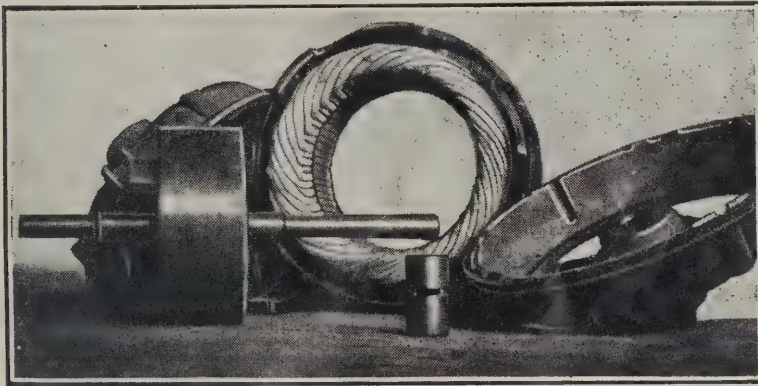
RECENTLY a representative from this journal had the opportunity of inspecting the works of the Monarch Electric Motors of Redfern, New South Wales.

This enterprising firm is entirely Australian and is manufacturing a grade of Alternating Current Motor that can compare very favourably with the world's best electrical productions.

The works themselves are commodious, occupying two well arranged and efficiently day-lighted floors. A large machine shop takes up the space of the ground floor. Here are housed the necessary heavy tools that

of former type coils and their subsequent insulation, and these incidentally are assembled and put into their respective stators on this floor too.

At the completion of the winding processes, which are done with every regard to safeguarding the insulation, particularly on the slot ends and turns, the whole machine is put holus-bolus into a vacuum impregnating tank which operates in such a manner that every pore and every crevice in the insulation is treated to a fully sufficient quantity of insulating varnish, and by adjustment of the air pressure of the tank, the surplus insulation is removed, and the iron work of the motor comes out of the treatment smooth and free from sticky varnish. The vacuum impregnation process is the only one that suffices for a reliable standard of insulation of the windings, both to each coil and to frame. By this means a guaranteed high insulation test, much superior to that required by the regulations can be banked on.



enter into the production of Monarch Motors. The principle machines are concerned with the preparation of the laminations used for the rotors and stators, and the machining of the various iron parts. All these laminations are made from a special imported grade of Stalloy lamination sheet, specially manufactured for transformer cores and armature punchings. This item is about the only non-Australian ingredient in the Monarch motor. The various bearing brasses are made in an adjacent foundry, so also the cast iron shells for the motors, and lift and winch iron parts.

The upper floor is principally devoted to the winding

under pressure and securely fixed by wedge pins. The end covers shown on each side of fig. 1 are fitted with slotted portions to enable them to be adjusted with ease into their correct position. These also carry the solid phosphor bronze bearings. The rotor, which is lying in front of the left-hand end piece is also built up of best laminations, and is fitted with copper bars, laid in slots to receive them and short-circuited at each end. The current which flows in these armature bars is induced by the action of the magnetic field of the stator just alluded to. This type of motor is called an Induction squirrel cage motor, and it comes as near

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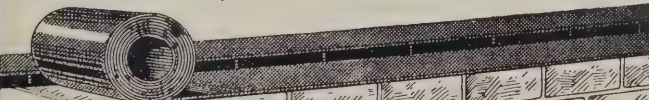
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to perfection in mechanical construction as any motor can. They are largely used in all types of factories, and their robustness and freedom from breakdown is a point that calls for special consideration. There are no brushes or commutator to attend to and to wear out.



Fig. 2

Fig. 2 gives a much clearer impression of the type of winding employed on the Monarch motors; note that the coil spacing allows plenty of room for effective ventilation.

With regard to the type of windings employed on the Monarch motors, it may be stated that on the small types which run from $\frac{1}{2}$ H.P. up to, say, 5 H.P., diamond coils are fitted, but in the larger sizes, such as that illustrated, the "Mush" winding is employed throughout the whole range of motor right up to the 50 H.P. size. All the machines are delta connected, and supplied with their starters, which are too, made at Monarch Electric Motors.

In the transformer department, men are busily engaged on the construction of high-grade transformers of practically every size. A recent order for an electric supply corporation was filled by Monarch transformer department, and included transformers of 10 K.V.A. and 75 K.V.A.

Fig. 3 depicts a recent type of electric winch that the company has evolved. It runs with great precision and is extremely silent. It is of the friction drive type, and provides a convenient, and economical means of handling material. In most places where these winches have been put in, the purchasers have been repaid by the time and trouble they save in a very short time. They may be belt driven as an alternative to the gear drive illustrated. The friction pulleys, as will be seen, have very large integrating surfaces, owing to the intermesh of the deep grooves. See the mechanism on the right of the illustration.

In operation, these winches are extremely simple, and an effective braking device is fitted, so designed that it will hold the maximum load in any position

The lift is easy, and has a wide range of hoisting speed. The construction is in accordance with the best modern engineering practice.

The Monarch Electric Co. also specialize in the construction and installation of electric lifts, both of the automatic and manual type, and have supplied elevators of their own manufacture throughout, including all switchgear and automatic door locks, to the Government Stores, Supply Department, Holbrooks Ltd., Greig Bros., Harringtons and other important firms.

The sturdy construction and easy running qualities of the Monarch Electric Lift have been favourably commented upon by responsible authorities, and the users express complete satisfaction.

The staff employed on this work, consists of selected men, highly skilled in their respective trades, and the result is reflected in the perfect workmanship and finish of the various parts.

The motors fitted to these lifts and winches of Monarch manufacture are of their standard design, rated to comply with the recommendations of the British Engineering Standards Committee. They are thus designed to withstand dust and dampness and require the minimum of attention. All the parts can be supplied from stock. All shafting is calculated by the company's designers on such liberal ratings that there is a wide margin of safety. In the matter of windings there is also provision for a 25 per cent. overload for two hours, thus ensuring the user ample protection against possible breakdown. All the motors are correctly proportioned, so that they may be truly said to give the maximum possible power with the minimum input of current. They are guaranteed direct by the local manufacturer, which is more satisfactory from the users point of view, than the possession of a guarantee given by an agent whose principals are thousands of miles away.

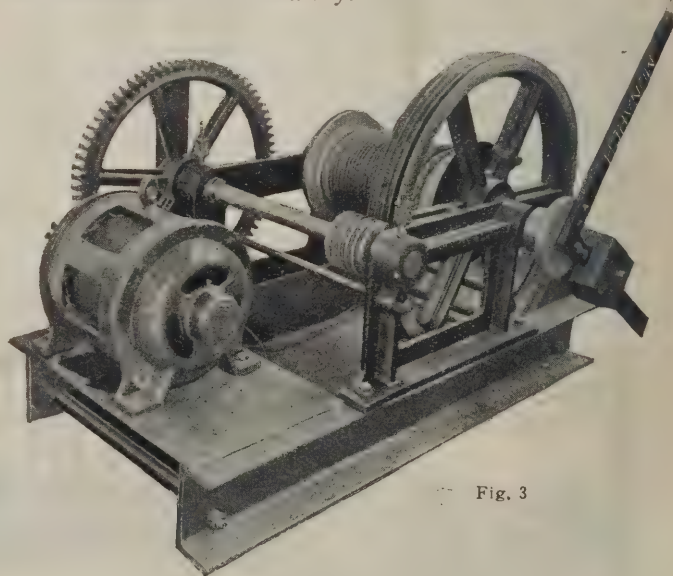


Fig. 3

In keeping with the firm's progressive and enterprising policy, when the works are moved to their new home, much additional machinery which they have already in their possession will be put into action, and by this means it is hoped that production can be speeded up, and operations generally extended.

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NEW SHOWROOM.

Messrs. Swans Ltd. are to be congratulated on the excellent showrooms which have just been completed at their premises at 304 Pitt Street. The idea uppermost in the management's mind appears to have been the absolute necessity of allowing prospective customers and clients to see everything under actual working conditions.

The showroom is conveniently located on the 1st floor, and contains anything and everything that the architect or home builder can possibly require in the way of electric light fittings and bathroom fixtures.

A special feature has been made with the latter commodities, and numerous compartments have been specially designed as model bathrooms. Here one may see under actual working conditions the very latest in all sanitary and bathroom appliances. Beautiful flush sided baths, latest medicus cisterns and basins, shower compartments, bath heaters and a wealth of designs in wall and floor tiling. Various types of the articles exhibited are on show, and in each bathroom a list of prices is hung in a conspicuous place so that any one interested may walk in and, without the aid of a salesman if he is engaged in serving any one else, can see for themselves exactly what every item costs.

There are three types of water services exhibited. The ordinary domestic bath heater, the automatic bath heater, which requires no attention whatsoever, and operates at the mere turning on of the tap, and the water boiler which always ensures a supply of hot water on a large scale at any hour of the day or night.

Model kitchens and laundries are also exhibited, and the articles displayed therein should appeal to the most discriminating of housewives. Beautiful porcelain and aluminium draining boards are all featured, and it is safe to say that if the average kitchen were so completely fitted up domestic labour would be reduced to a minimum and the servant problem solved.

In passing it might be mentioned that an elaborate system of hot water radiators is in course of construction to supply warmth to the various offices of Messrs. Swans Ltd. Every member of the staff is provided with a special make of chair which ensures

the maximum of comfort during working hours. Fans are also provided for use during the hot weather.

In short, Messrs. Swans Ltd. new venture is one of the most up-to-date of its kind in this city, and the firm are to be highly commended for the enterprise shown in its erection.

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A fact of utmost importance to buyers of electrical goods in Australia, is the announcement of the incorporation in New South Wales of the Australian Westinghouse Electric Company Ltd. Offices of the company have been opened in Sydney at Cathcart House, No. 11 Castlereagh Street, and it is contemplated opening branch offices and distributing agencies in various other cities of the Commonwealth. This Australian company will represent all the various Westinghouse electric interests, comprising 23 factories employing over 44,000 persons and having a monthly payroll of very close to £1,000,000.

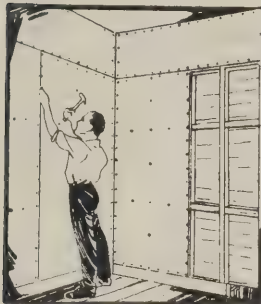
F. N. Kollock, Managing Director of the new company, and in the past an executive officer of various Westinghouse Companies, will be in direct charge, and has stated that the Australian Westinghouse Electric Company Ltd. will have available complete facilities for supplying the needs of the Australian electrical market. Every variety of electrical apparatus from an electric bread toaster to the largest machine for the generation of power for large manufacturing projects will be handled.

The Australian Westinghouse Electric Company Ltd., will also have for the use of its clients, a large staff of special engineers versed in the technical problems of electrical engineering. These specialists will always be ready to assist Australian manufacturers and others in the application of electrical apparatus in their works and homes.

The opening of these offices is the fulfilment of the desire of Westinghouse to place its great resources more fully at the service of Australia.



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ELECTRICAL INSTALLATIONS

THE ARCHITECT AND THE BUILDER.

By "M.I.E.E."

In the electrical equipment of homes, factories, shops—whatever it may be—there are four parties concerned: the architect, the builder, the electrician and the owner. Obviously, the last-named, who has to foot the bill, would be the gainer if the other three could work together with a view to keeping down the cost of the work, but in how many cases do we find effective co-operation between even two of the three? Only in the case of large and important buildings, in which the adoption of electricity for lighting and power is a matter of course, do we find provision made, more or less efficiently, for the execution of the electrical work at the proper time and in the best way—or in recent times when a local authority decides to provide for the use of electricity in a housing scheme. Yet the fact that for illumination electricity is nowadays without a rival, and that its use is rapidly extending for cooking, for occasional heating in dwellings, offices and shops, and for an infinite variety of other purposes, cannot be ignored. Nevertheless, it is common practice still to design and erect houses and other buildings and to finish them ready for occupation before the installation of electrical equipment is so much as considered. Usually they are piped for gas and water, apparently because from time immemorial it has been customary to make such provision; but the times have changed, and modern needs should be met in modern buildings from the first.

The owner depends upon the architect to advise him and to adopt the most up-to-date practice; the builder must act upon the instructions of the architect, and the electrician comes in a bad third to make good the omissions of his predecessors on the job, and to overcome the difficulties with which he is confronted as best he can. It is to the architect, therefore, that the appeal must be addressed, for he should give the subject his close consideration.

Dealing first with illumination, it would be too much to expect the architect to be an "illuminating engineer" and to devise a complete scheme in detail for this purpose; but he is compelled to deal with the matter in respect of daylight, at least, and as he is solely responsible for that class of illumination, he must necessarily be familiar with the broad principles by which it is governed. Since he is charged with the design of a building which shall be habitable and suitable for its purpose, surely he ought to take into account not only the daylight hours, but also those during which artificial illumination will be necessary and make the proper provision for it in the first instance. The mode of illumination—direct, semi-indirect, diffused or concentrated—and the quantity of light required, measured in lumens, for average conditions should fall within his purview, and in a building which has claims to architectural beauties he should specify and approve the design of the fittings. By providing ducts for the wiring in the walls and ceilings he can go farther and fix the exact positions of the lamps;

but in important cases of this class the collaboration of a trained illuminating engineer is almost indispensable. On no account should such matters be left to the discretion of the contractor.

But to equip a building only for electric lighting is a mistake. The innumerable benefits derived from a supply of electricity render it desirable that ample provision should be made in the first instance for their enjoyment. The applications that we have in mind fall into two classes: those in which the electrical apparatus is permanently fixed and those which involve the use of movable appliances. Under the former head are included electric lifts, cookers, water heaters, etc., all of which call for specially heavy wiring. Their positions can be determined before the work is commenced, and even if the building is not actually wired at the time, suitable ducts should be provided in the walls, with outlets, at appropriate points, to enable the wiring to be done at minimum cost and without damage to walls and floors. It will be found that a very few of such ducts will suffice to give access to every story at trifling cost. The main thing is to provide for the vertical runs of cable from floor to floor—the rest is easy. Much damage to floors can be avoided by the simple expedient of screwing instead of nailing one or more of the floor boards lying near the centre of the room or corridor. These facilities being provided, it is surprising how much wiring can be done without disturbance to decorations, etc.

Under the head of movable appliances fall radiators, suction cleaners, irons, fans, kettles, standard lamps and a host of minor accessories. With the possible exception of the first-named, none of these requires heavy conductors—even a three-kilowatt radiator at the usual pressure needs nothing larger than 7/22 S.W.G., whilst the smallest conductor permissible for lighting circuits will readily carry any of the others. To supply devices of this class at least two wall sockets should be fixed in each room. Here, again, vertical ducts from basement to roof are necessary, these ducts also carrying the cables for lighting purposes, bells and telephones; but, as the sockets should be fixed on the skirting boards, no further provision than the ducts and the screwed floor boards need be made for them.

An important point may be mentioned in connection with the use of electric radiators. Where these are used there is no necessity whatever for coal fires and chimneys in bedrooms or even in small offices. Hence a very material economy in building work can be made—sufficient, in fact, to cover not only the cost of wiring the building throughout, but also to pay for no small part of the electrical apparatus installed. Ventilating ducts, of course, should be provided, but these can be included in the thickness of the wall, and the abolition of chimney breasts and mantelpieces increases the useful floor area of the rooms. It is not yet generally realised that, in spite of the supposedly

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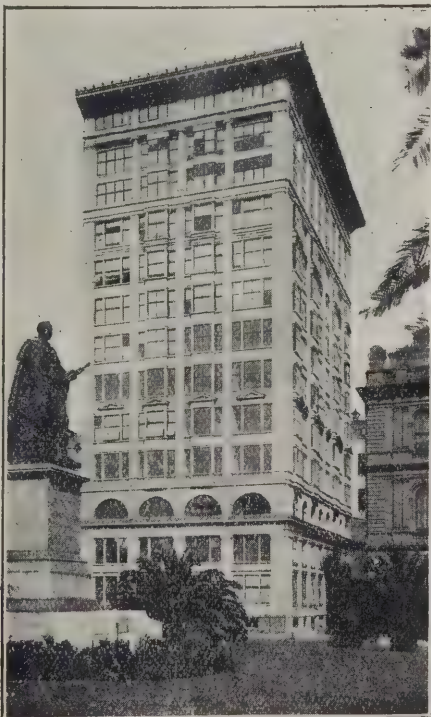
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high cost of heating with electricity, it is not an uneconomical proposition when properly carried out, if due allowance is made for the value of the cleanliness, saving in labour, longer life of decoration, and unrivalled convenience resulting from its adoption.

A point which calls for mention is the provision of proper accommodation for main switches and fuses, meters and distribution boards. Suitable positions for the latter can readily be foreseen, and recesses should be provided so that they can be sunk flush with the surface of the wall, in line with the ducts previously mentioned. Under the usual conditions, when electrical work is carried out as an afterthought in a building already completely finished and plastered, the cost of sinking the boards, etc., into the walls is prohibitive, and the consequence is that various items

of the installation are obtrusively prominent and unsightly excrescences.

The subject of this article has by no means been exhausted; indeed, the writer has barely touched the fringe of it, but it is hoped that the important position that electricity occupies in an up-to-date building and the urgent necessity for making provision for its use *ab initio* may be more fully realised by the architect, with the result that under his instructions the builder will be enabled to provide for its economical installation and the electrical contractor will be brought on the job at the right time to find that "cutting away and making good" is reduced to the minimum and that his work is already half done.

—The Builder.

INDEPENDENCY OF BEAUTY AND COST

(By J. Hembrow, A.R.I.B.A.)

We know that the highest beauty in art is obtained with the minimum of elaboration, and that the lower forms and periods of art hold the maximum amount of mere decoration. In the lower races of humanity, where culture has reached only an elementary stage, as we judge it, we find the most profuse and costly decoration conceivable, involving enormous labour and terrible suffering; and yet the grand simplicity of the classic proves the exact difference between the relative levels of the peoples. The Roman architecture was much more profusely ornamented than the Greek, yet it was admittedly lower in type. The beauty of the human figure exists in spite of clothes—not because of them.

In order to obtain beauty in architecture, it is relatively negligible what money we may or may not have for embellishment. It is vital, however, to find the form most suitable to the purpose of the design which, when expressed with care and taste and made permanent in good materials, will give beauty just as the figure of one man brought up to physical labour or another to intellectual effort will each have its own separate significance. Having obtained this foundation of beauty, its dress, according to the means disposable, should suit its purpose, either in the elaborate

form suitable to some important civic building or the simplicity of a group of humble cottages. Just as one should differentiate in the clothes of a high personage and a humble one, we must discriminate in our buildings without losing sight of the fact that the humble personage or building may have the greater beauty of the two. Form, which is the basis of beauty, may have to be obtained in spite of many difficulties, but each difficulty has its solution if it is approached with confidence and determination. Limitations must be accepted without fretfulness and made into opportunities. The problem which appeared irksome and dull can generally be solved in a way which will have an individuality and interest beyond any easily conceived and recorded design which comfortable circumstances might have made possible.

We have to consider also the best expression of form, and here one is faced with the limitations of material. In one district stone will be out of the question; in another brickwork may be found less easily than stone. Roofing materials vary, different kinds of craftsmanship may be difficult and costly to obtain, but each material or combination of materials forms an interesting study, either from the point of view of colour or surface and as the motives of the

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design are of vast importance. Is it superfluous to point out how hideous buildings become when the expenditure of large sums of money is entrusted to vulgar designers? It is a custom with all of us to praise the beauty of the old half-timbered houses and the old stone cottages of some centuries ago; but they appear in these forms, not because their designers in all cases chose the most ornamental mode of expression, but because those forms and materials were the outcome of local conditions. The best and strongest buildings, except by accident or vandalism, have remained, and thus we have the happy result of right building. This emphasises the fact that we have to find the most suitable form for our purpose and the best material that we may attain to beauty. Finished work will not necessarily be more beautiful because part of it has come from Italy and India, but only more highly ornamental or costly. Where there is little money for ornament, it is often possible, by the judicious disposition of materials, to gain charming effects of colour; or, if little colour may be obtained, some careful method of design may give us the dignified plain surfaces and simple beauty of, say, the late Georgian period.

However exacting a material may be, it will be found to have possibilities of its own. The artist who designed the steelwork of those two beautiful bridges in Paris, the Pont Mirabeau and the Pont Alexandra, seems to have taken into account the very shadows of the rivets in their treatment, and so economically and justly have disposed this generally considered ugly form of construction (steel) that the steel-work itself is a thing of beauty, apart altogether from the ornamental features so well conceived and disposed. In shaping a beautiful building it is necessary to proceed as though we wished to make a painting of a beautiful human figure. Everything will depend upon the selection and realisation of the figure, and, having obtained it, it may be our fancy to clothe it; but the beauty of the work will lie in the figure itself. Bad taste in its clothing may even detract from its apparent charm. If it is a high personage to be clothed, the robes must be fitting their royal purposes; if a humble, they must be simple; but the result will remain a handsome king or a handsome peasant. In fact, so definite is this that while one might dress the high personage simply without much injury to his dignity, the humble one would be ill at ease in kingly wear. In the treatment of buildings naked beauty must be first obtained, then it may be clothed according to its purpose and our means; and, whatever its end, it will be beautiful.

So far does sympathetic observation corroborate this that the most casual observer, even of the development of our towns, and particularly our suburbs of late, will find that the excessive ugliness of a very large part of them can directly be traced to their great cost.

One of the most important matters—ininitely more important than the amount we are going to spend—is that the design should be suitable to its surroundings, either surrounding country or surrounding buildings. This effort is hampered somewhat cruelly when the surrounding features vanish or are wantonly destroyed, a contingency for many years unavoidable in this country, but certainly possible of avoidance

now. In many districts, for instance, private acts exist compelling the culverting of all streams—surely one of the most costly methods of destroying beauty and seeking ugliness that could possibly be devised. Certainly no architect wishing to lay down a beautiful village would begin by doing away with an element so naturally beautifying and so likely to confer additional beauty. The beauty of a group of cottages does not so much depend upon the cost of them, but upon whether the individual buildings are interrelated and harmonious as a whole, or conflicting and badly considered. This is admirably illustrated by the cottages on the Duchy of Cornwall Estate, Kennington, S.E., or roads like Asmun's-place, at the Hampstead suburb, each of which are suitable to their own individual setting, and are grouped together in their proper significance, and either of which would look wrong and possibly ugly if their settings were exchanged. Smith's-square or Lincoln's Inn are more beautiful than Leicester-square, but not because the buildings composing them are more costly; they are, in the main—in the first example, at any rate—the plainest of plain Georgian, while Leicester-square has the elaborate fronts of two theatres. But the features of Smith's-square are balanced and inter-related—were, in fact, designed. What ornament could add to the charm of Staple's Inn? Would it not detract from the beauty of the plain, gentle dignity of the houses, which have all the quiet beauty and simplicity of the best thought of their century? Would Staple's Inn be more beautiful if the buildings around it were richly ornamented at great cost? To create beauty it is not so much money as brains that is required—not so much the unlimited expenditure of a spendthrift purse as the generous expenditure of the heart of the artist. In simple taste we can have beauty, while the largest purse misapplied will bring nothing but tawdry poverty.

How many an old barn has more beauty than some of our modern churches and civic buildings, smothered in ornament? The difference is not so much that which lies between a barn and a church as between a good, plain barn and a bad ornate church. Or what one of us does not know of the villa erected by some successful retired man of vulgar mind, designed by his successful speculative builder, with a drawing-room a bad "Chocctor," a dining-room like a saloon bar, and a hall like nothing on earth? And who has not turned with relief to simple plaster walls done in plain, delicate shades. We realise at once that it is not the expenditure of money, but of art, which makes success. Half the ugliness of our streets is due to the anxiety of young architects to dominate the street with the vigour and originality of their own designs, irrespective of the proper office of the building designed in regulation to its neighbours. In such cases buildings lose even their own value as examples of individual design, and become mere arrogant and egoistic nuisances which annoy and disturb much more than they interest or satisfy. We shall not be judged by what we could have done if things were different, but by what we did with the opportunities given to us.

In country districts problems are sometimes less difficult. Nature has a way of adopting the efforts of man and forcing them into her scheme of universal

beauty, and unless they be very bad they lose most of their minor faults under her generous hand; but an ignorant and bad design remains an ignorant and bad design to the end of the chapter, and because we have much more freedom we have more responsibility. It is cowardice to say that nothing can be made of a building because little money is available. If we have enough to build well—and no architect ought to build ill—we must imbue our work with beauty of some kind or we are not artists. We can attain character and interest whether it be by the scholarly use of pure proportion or an artistic use of rambling outline and scrambled colour.

That which goes against the general attainment of beauty by our profession as a whole, so far as the design of more humble buildings is concerned, is the spirit—most heartily to be condemned—of a very commercial origin, in which the architect gets together more or less “stock” designs to fit all places and conditions and is too lazy and indifferent to face each individual problem which arises with the new interest it surely has. He mostly turns the matter over to an assistant, saying, “Just plot down something like that house for So-and-so,” making a few rough notes of the different requirements and coming back when the pencil sketches are done, saying: “That is good enough for the job; there is nothing in it.” He excuses himself by asking, “Well, what can be done for a shilling a foot?” Much may be done at a shilling per foot even now if the “artist” is an artist, and has spirit

enough to try. And this assuredly will be done: the architect will either prove himself a worthy artist or a mere money-grabber.

Problems are all so widely different that it is not possible, nor would it be desirable, to be dogmatic in detail. All depends on just the same subtle difference in temperament and spirit as lies between the two housewives and their two different homes—the one house often, too, a very poor one, where everything radiates brightness, freshness and fragrance, and the other, not always a poor one, where all is dull and musty and unattractive. One woman can make her poor home beautiful on a few shillings a week, while another, who lacks the interest and spirit and affection, can fail to do so on many pounds. What we as artists should do is, surely, to make our handiwork stand out in the same unobtrusive but delightful way, and we shall find the proof around us every day, as we can now if we look seriously for it—that it is the genius of the artist which counts.

The function of an architect is not merely to draw lines from which others can build, which indicate a house containing the various necessary parts. He should strive to imprint the highest impulses of our times upon the buildings set aside for their various purposes in the highest possible manner, and unless he attacks his problems sincerely in this spirit he will fail to attain the standard of beauty and usefulness which is open to us all.

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CONTENTS, FEBRUARY 15th, 1924

	PAGE		PAGE
I.A.N.S.W.—Minutes of an Ordinary General Meeting	14	Correspondence	25
Institute Library	15	Schedule of Wages as per Awards and Agreements	25
Lecture—"The Manufacture of Portland Cement in Australia," by Mr. E. P. Kneeshaw	16	Institute of Architects' Annual Exhibition, 1924, Model Competition	26
Sydney Regional Plan Convention Exhibition	24		

INDEX TO ADVERTISEMENTS

	Page		Page		Page
Adams, Wm. & Co.	xxiii	Goodlet & Smith Ltd.	xxvi	Petrucchio, Dreelin & Gamble	x
Anderson, Wood, J. & Sons	xxv	Granolite Paving Co.	xiii	Plant, W. & Co. Ltd.	—
Anselm Odling & Sons (Australasia Ltd.)	vi	Hardie, Jas. & Coy. Ltd.	xviii	Porter, Maxwell	iii
Australian Tesselated Tile Co.	iv	Harding, C. A. & Son	xxv	Rosenfeld & Co.	iii, xiii
Armco Iron Australian Agency	viii	Henry Hughes & Co.	iii	Sandy, James & Co.	ix
Ashwin, John, & Co. Ltd.	xv	Holdsworth, Macpherson & Co.	ix	Saxton, A. C. & Sons Ltd.	xv
Australian General Electric Co.	—	Hordern, Anthony & Sons. Ltd.	v	Shaw, Pearson C.	xxv
Berger, Lewis & Sons (Australia) Ltd.	inside back cover	Jefferies & Dunningham	xxv	Shorter, John & Co. (Doulton)	—
Brooks, Robinson & Co. Ltd.	xii	Johnson, Clapham & Morris Ltd.	ii	Skovronski Bros.	xiv
Cement Mortars Limited	xxi	Kandos Cement Co. Ltd.	xxviii	Steel Products (Aust.) Ltd.	xxi
Crane, G. E., & Sons Ltd.	xix	Kingloc Ltd.	viii	Sterling Varnish Co.	xiv
Cobcroft, C. V.	x	Lassetter's	Inside front cover	Swans Ltd.	ii
Commercial Copying Co.	iii	Loneon & Hocking	xxv	Sydney Glass Co. Ltd.	xxii
Commonwealth Portland Cement	xiii	Lough & Shaw	xxv	The Borer and White Ant Exterminating Co. Ltd.	xiv
Cormack, L. A.	xxv	Lysaght, John (Australia) Ltd.	xviii	The Trusseed Concrete Steel Co. (Aust.) Ltd.	xviii
Danks, John & Son, Proprietary Ltd.	back cover	Manco Flooring Co.	x	Taylor, J., & Sons, Ltd.	vii
Dobson, Franks Ltd.	xii	Meggitt Ltd.	xi	Vincent, George	—
Dorman, Long & Co., Ltd.	i	Major Bros. & Co. Ltd.	iv	Wilson, W. & Co. Ltd.	x
Expanded Steel & Concrete Products Co.	Inside front cover	Melocco Bros.	xii	Wormald Bros. Ltd.	vi
Garraway, H. E.	xiv	Montgomerie-Neilson & Co.	vii	Wunderlich, Ltd.	xii
		Monarch Electric Motors Ltd.	xv	Woods, G.	x
		Ornamental Steel Mfg. Co. Ltd.	xxiii		

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